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Cotton Plus Glass Equals Electrical Conductors

SCIENTISTS of USDA's Science and Education Administration working with chemically-treated cotton fabrics have made a discovery that may have important impact on electronics and solar energy.

They have found a way to use the treated fabrics to make glass conduct electricity.

Truman L. Ward, physicist at SEA's Southern Regional Research Center at New Orleans, discussed the findings recently before the International Conference on Metallurgical Coatings underway here this week.

Ward reported that he and co-worker Dr. Ruth R. Benerito have prepared glassy films by treating cotton fabric with a solution of sodium plumbite (lead salt) and heating the cotton to 1,100°F. in a closed oven in contact with

glass. During heating an extraordinary thing happens — silicon migrates from the glass to the treated cotton in the solid state at temperatures well below the melting point of the glass.

The resulting glassy films contain considerable carbon from the cotton which decomposes in the 1,100°F. heat, are resistant to both acid and alkali, and are brittle and hard enough to scratch soft glass and stainless steel.

Electrical conductivity can be imparted to the glassy films by covering the treated fabric with aluminum foil before heating. During heating in the oven, the foil completely disappears into the glassy film. Ward said that probably the amount of aluminum included in the films can be varied to achieve a wide variety of electrical properties that would be of interest to the electronics industry.

Ward reported the lead-treated fabric has some other interesting applications. For example, the fabric can be used as an adhesive to fuse together dissimilar glasses that ordinarily do not fuse together very easily or very well. The bond is so strong, that the dissimilar glasses will break before the bond will break.

Although the glassy films are normally colorless, they can be changed to gold, purple or gray when exposed to the direct flame of an open burner. The process is reversible and the color can be removed by reheating the sample to 1,100°F. in a closed oven.

Although much additional research is needed, there are indications that the glassy films may be of value in the fast-growing field of solar energy.

